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ABSTRACT

This paper examines the dual coding hypothesis, a model of the coding of visual and textual information, from the perspective of a mass media professional, such as a teacher, interested in accurately presenting both visual and textual material to a mass audience (i.e., students). It offers an extension to the theory, based upon the various skill levels of members of the audience at processing information, and provides a series of 12 practical suggestions to those encoding visual media messages. The suggestions are intended to increase the accuracy of integration of visual and verbal symbols and the likelihood of faithful communication between the encoder and the audience. An introduction to the dual coding hypothesis serves as a basis for the 12 suggestions, which address issues such as verbal and visual stimuli; imagens and logogens; image receivers; concept formation; information conveyance; discrepancies; anxiety; and the mediated communication model, consisting of both a content and a receptions system. Finally, to make the model more effective in the classroom context, it is recommended that the model be extended to cover the entire information transmitting process from source of information to the audience. (Contains seven references.) (MAS)

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Message Into Medium: An Extension of the Dual Coding Hypothesis

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Introduction

Among others, Paivio (1979, 1986) suggested that the left and right hemispheres of the human brain operate together to process visual and textual information. The difference between what Paivio suggested and the work of others was that he presented a model of the coding of visual and textual information called the dual coding hypothesis. This paper examines this theory from the perspective of a mass media professional (*i.e.*, a teacher) interested in accurately presenting both visual and textual material to a mass audience (*i.e.*, students). It offers an extension to the theory, based upon the various skill levels of members of the audience (students) at processing information, and it suggests a series of twelve practical suggestions to those encoding visual media messages which should increase the accurate integration of visual and verbal symbols and the likelihood of faithful communication between the encoder and the audience.

Also suggested is an extension of the mediated communication model of Anderson and Meyer (1988) which incorporates the twelve suggestions into the mediated communication process. Dual coding theory, as does every theory of how we codify information, needs a model of the communication process within which it can be effective. This particular model was chosen because classroom communication is a mediated process, operating, according to Anderson and Meyer, within the framework of a social action perspective. A more traditional view assumes the individual is the central component of the communication process, a "complete, intact and reacting intellect marked by capacities and predispositions that will respond with predictable outcomes given the right interpretation of content" (124). Their perspective calls for the individual to be perceived as an "incomplete, interacting and interpreting intellect, functioning within and enabled by strategic social action using the tactics of sense making to improvise the continuation of that action" (124). This second view is more in keeping with the way current education theories view the student, constantly interacting with class content, their colleagues, and their instructor to achieve the desired, and also constantly changing, goal of learning. This perspective, in effect, views the student as a communicator, a participant in the learning process.

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The Dual Coding Hypothesis

The dual coding hypothesis states that we process information using two separate but interrelated modalities — the verbal and the visual. These two systems work together to allow us to make sense of our environment, although each has its own method of operation and procedures which govern them. Work conducted since the theory has been proposed has continued to support this dual processing system (*e.g.*, Mayer and Anderson, 1991, 1992, Sadoski *et al*, 1993a, 1993b).

Paivio uses two concepts to distinguish between the textual and the visual (which he calls the verbal and the nonverbal). These are the imagen and the logogen. The logogen is a representation of the verbal characteristics of a message, while the imagen is a representation of the visual elements of a message. Each of these has their own reference subsystem, where they are compared to other representations of their own type. In addition, they share another reference system which combines these two subsystems into a common reference system. The meaning which results from the evaluation of these is taken as the overall meaning of the message. It is from this process that the theory derives its name.

The theory itself is a synthesis of a great deal of research, and it is based upon a set of assumptions covering the properties and functions of the various component parts of the theory. It is a very thorough and complete presentation of a theoretical model which meets most of the demands of the person interested in studying the communication process, especially the encoding of messages. From the perspective of a professional communicator working in the mass media, however, it has a serious problem.

The theory does not take into account the variable abilities of people to process information. The younger a person is, the more they process information better in one modality than the other. That seems to hold across ages. That is a major concern in today's marketplace. The effect of media messages, especially the visual elements which so enthrall younger viewers, can be electrifying. And that effect has been taken by the young into all elements of their lives, including their "work" in this society, as students in a classroom. As we age, we do not seem to lose this ability, but instead we seem to develop complimentary verbal abilities.

This difference can be a considerable concern to the classroom teacher, especially for younger students. In spite of this, there seem to be some characteristics of both the imagen and the logogen which are useful in coding messages for both. These are offered below.

Suggestions

The following are offered as a synthesis made by the author of some of the ways imagens and logogens might be useful in coding messages within the classroom environment. Many of these have not yet been examined using empirical research methodology. In some, the research has been done, but either it has been directed into a communication context other than the classroom or it has been done within another discipline. In some cases the evidence is purely anecdotal. They are offered in the

spirit of opening possibilities for inquiry.

1. Combine verbal and visual stimuli to make the message more memorable.

Since people use both imagens and logogens together, it makes sense to utilize both when designing messages. Research has shown consistently that this combination is the most effective in the accurate transfer of information (*e.g.*, Mayer & Anderson, 1991, 1992). Each receiver decodes connotations from messages which will be based upon the receiver's reference systems for those stimuli, and these will be different for each person. For example, two people may perceive only the visual stimulus of a flower, but each will perceive the resulting message differently because of the connotations that stimulus has for them individually. These personal connotations may be the message elements which makes that message more memorable for one person than for another.

Radio and television writers have known this for years. They've used elements, particularly those peculiar to the medium in which they're working, to keep the audience's attention while they add other message elements to carry the meaning they are interested in conveying. Entertainment need not be amusing, funny, or even cute to be effective. The criteria used by media professionals is that part of a message (usually the first section) has to engage the interest of the audience and hold that interest until the intended meaning has been imparted to the audience by that message.

2. Use stereotypes of both verbal and visual modalities together to convey a great deal of information in a short period of time.

Media use stereotypes to convey a great deal of consistent information in the shortest possible time. In many cases the stereotypes are interesting and have an entertainment value for the audience. One of the reasons stereotypes can be used in this way is because of the almost universal understanding of the characteristics which can be conveyed by use of a specific stereotype. For example, a redhead may be seen as an intense, more emotional person than a blonde to one person and not another, but the chances are both see the redhead as being more hot tempered. The temper is a primary characteristic of the redhead stereotype, while the more intense, emotional characteristic may be an association shared by a smaller number of receivers.

One of the ways media professionals have developed to accomplish a desired connection is to use several stimuli (imagens) which convey a similar meaning, but which also do not reinforce an undesired connection. By using several stereotypes at once, we can combine the effectiveness of that one characteristic, make it a bit more obvious to the audience that this is the characteristic upon which we wish them to place their emphasis. Other associations of that particular stereotype, which are not reinforced by the other stereotypes used, will be less effective because they lack the strength of numbers of the major association. For example the use of a female blonde stereotype to convey a materialistic person works when connected to several other stimuli, both verbal and visual (logogens and imagens) which also convey the idea of materialism but which do not share

their other characteristics with the stereotype of the blond female.

The impression that stereotypes are negative has been created in response to the potential damage which can be done in using stereotypes and misrepresenting an individual in the process. While such an outcome is possible under the best of circumstances, the communication professional has an ethical responsibility to make the effort to avoid such associations. Within the classroom environment, a teacher has the same professional responsibility to see that stereotypes used do not create harm. They still will be used by the students themselves outside of the subject matter of a course. But the teacher can control the use of the stereotype in the instructional setting.

3. Whenever possible, tie the verbal stimuli to the visual.

Imagens and logogens should be connected to each other so that both coding processes yield complimentary meanings. For example, to use a visual image of a hamburger with change sitting next to it on the counter might not convey the impression desired when used by itself. But when the text suggests that this particular meal will save you money, the image which the visual conveys is clear and compliments the verbal message precisely. It is much more likely to be effective in conveying the desired idea.

4. Use the visual stimulus to convey a striking image, one that is easily retained, while using the verbal stimuli for the presentation of logical representations.

Mayer & Anderson (1991) used an animation of the operation of a bicycle tire pump to test the effectiveness of visual stimuli in making an effective impression on the viewer. Their results suggest that the imagen might be better used to provide a striking image, easier to retain than a logogen, than a verbal description. Many of the impressions people tend to gain come visually, as in the stereotypes discussed previously. We live in a visually oriented society, where the audience wishes to see for themselves. This applies not just to physical actions, such as the tire pump, but it can also be extended to the desire to see an event on a newscast rather than have the event described.

If that is true, where can the verbal message elements be most effectively used? Visual stimuli can show something, but the understanding of an event (its importance, the impact it will have on our lives) cannot be completely presented visually. We look to others, experts or those more knowledgeable in specific fields to give us that information. And we have become accustomed to receiving that information verbally. Therefore, the logogen might be more effective in conveying a logical and specific progression more concisely than an imagen. In other words, use verbal message elements which have persuasive powers, keeping the visual message elements for the striking impressions we wish to have receivers retain associations with that idea

5. To alter a receiver's reference system, use specific combinations of imagens and logogens designed to achieve long-term results.

All the research done on attitude change over the past several decades have shown that attitudes and behaviors can be altered.

Communication skills which are useful in these instances can be used successfully in changing the reference systems of any receiver. Obviously, some people accept these changes better than others. Outside classroom learning can be conceptualized in the same fashion, since this kind of behavior modification learning has been well documented. Inside classroom learning (*i.e.*, cognitive learning which is devoted to advancing knowledge and understanding rather than behaviors) has traditionally been more of a problem.

But cognitive learning can be conceptualized as a change in attitude, since several learning theorists have used changes in attitudes as a necessary precondition for a change in understanding, and hence a change in learning. In any case, there is little doubt that the reference systems may be altered over time, either deliberately or as a process of ongoing growth and development. The trick is to have these changes be ones which are intended, not those of chance.

These alterations in the reference systems (those involving the imagen, the logogen, and the combination of these two) are difficult to obtain. They require consistent reinforcement and adjustment, since any long-term modifications may be reversed involuntarily, as if by habit.

6. Imagens used alone create more misunderstanding than logogens used alone.

Paivio suggests that when we encounter an imagen alone our mind calls up a logogen from our memory or experience, and uses that as the complimentary side of the message which undergoes dual coding in conjunction with the original stimulus in arriving at an understanding of the message. Similarly, when we encounter an imagen, we call up words which we associate with the that image. In either case, we are developing our own, peculiar stimuli which we will use to determine the meaning of the message. It would seem that it would be advisable to provide both sets of stimuli so that we, as encoders, can be more in control of the associations which we wish receivers to use in deciphering our intentions rather than to allow the receivers to develop these self-generated stimuli without our guidance.

Also, the association of meanings with images is more imprecise than the associations which are made with verbal stimuli. Since these are subject to such wide variation, misunderstandings seem more probable than improbable. Logogens should have a better chance of achieving success in conveying an idea, but the evidence is very clear that the association of both, operating in tandem whenever we wish to pass on an meaning or an understanding has the best possibility for success. Consider the image of a beautiful woman used in an advertisement. Without a clue from the encoder as to how to interpret that stimulus, any number of possible outcomes is possible. However, when the receiver is guided to the meaning the encoder intended, the connection can be much more productive, *i.e.*, the product will be recognized and a complete sales message will have been presented.

7. Any visual learning which is likely to be effective needs to be tied to the utility of that imagen to the receiver.

If the receiver sees no immediate utility to the visual stimulus used, while learning may take place, it will not be processed as clearly and with the immediacy which would follow otherwise. Showing how to repair an automobile engine has little visual appeal to a person who sees no reason to learn to repair an automobile engine, although the intellectual information may be seen as interesting and informative. The understanding which results will not necessarily be achieved to the same degree as if the interest of the receiver had been to repair automobile engines for a living.

8. Verbal stimuli should be better able to convey concrete information, while visual images should be better at conveying more abstract thoughts and concepts.

It has been an axiom in public speaking classes for years that visuals are best used to convey concepts which are more general in nature. Verbal messages can provide specific detail in support of an idea better than visuals. When precision is desired, it is best to provide detailed information with the verbal message and to summarize the main point with a generalized graph or chart. This allows the listener to concentrate on the outline, the structure of the points, while keeping the oral senses tunes to the details which fill the gaps left from the visual. If the roles of the verbal and the visual are reversed, the listener has a much harder time processing the information.

9. New concepts form around both textual and visual stimuli.

It seems that there is little distinction between our ability to gain new concepts from both the verbal and the visual stimuli to which we are exposed. Some people seem to have a preference for one or the other, but this does not seem to be anything more than a preference. However, the age of the person may be an indicator of the preferences that person has for the manner in which the stimuli may be more efficiently utilized.

For the younger generation, it seems as if they depend upon the visual stimuli for identification of the new concept rather than the verbal stimuli, no matter how detailed, clear, and memorable the verbal stimuli seem to be. People entering the harbor at New York still seem to get their most vivid conceptualization of freedom and the guidance doctrine of this country from the Statue of Liberty, a strong visual image in this culture, rather than from the verbal message at her base. And from all indications, the MTV phenomenon seems to confirm that the younger generation prefers visual stimuli, even in a form such as music which has been primarily non visual until this generation.

10. Discrepancies seem to be better represented by visual stimuli rather than verbal stimuli.

This seems to make sense not only because of the differences in physical dimensions provided by visual stimuli, but also because the concept of discrepancy in our culture involves the idea of a physical dimension. Differences in attitudes, for example, are shown as differences between positions on a line, with the physical distance separating the attitudes more important in conceptualizing the differences rather than the verbal characteristics of the positions which might prove more useful in an analysis of the discrepancies.

Even in the case of verbal discrepancies, where no real physical dimension exists, people of all ages have shown a preference for the visual as the principle channel to convey this. We accept evidence of differences by seeing rather than by logically defining differences between ourselves and others, even when those differences seem to be in attitudes and values. While this may not necessarily be based upon the current culture's use of visual stimuli, such as TV, movies, posters, and so on, We also tend to wear visual representations of the differences between ourselves and others on our clothing and our possessions (bumper stickers, jackets, even underwear).

11. Anxiety and uncertainty reduction seem also to be better served by using both visual and verbal stimuli together.

One of the primary anxiety reduction techniques ask subjects to relax and place pastoral, soothing scenes into their minds while also using peaceful and soothing words and phrases. This combination seems to work very effectively.

Uncertainty reduction is used when a person wishes to t accept the consequences of a decision which they have already made. Although purely anecdotal, people seem willing to accept the uncertainty about life and its twists and turns in the form of visual rather than verbal stimuli. Some use the symbols of the Zodiac, some use the image of a pair of dice, some use the image of a professional at work, and so on.

12. It seems uncertain what part imagens and logogens play in determining more complex behaviors.

However, if this connection is consistent with the connection between stimuli and some of the more simple behaviors, it seems likely that some combination of both imagens and logogens determine how we behave in many of the circumstances we face day to day. Modeling behaviors seem to be formed more from observation than from description. Our manners and mores seem to be more developed visually rather than verbally. And our concept of everyday learning, even in the more abstract contexts, seems to be more grounded in visual stimuli rather than verbal stimuli.

The classroom environment, however, is a w place where we have deliberately matched verbal and visual stimuli together. Our concepts of competence and literacy are tested verbally more readily than visually in the more intellectual subjects, such as philosophy, social sciences, even the behavioral sciences. In this case it appears that logogens may be more acceptable as measures of competence than are imagens. However, at present the argument over the effectiveness of the learning which is expected to take place in the classroom is very heated. While this battle has been ongoing for many generations, the place of the logogen as primary stimulus within the classroom seems to be at stake in the outcome. And as a result, the use of more visually oriented methods of determining knowledge and ability may be coming into general use.

Mediated Communication Model

Anderson and Meyer (1988) have suggested a mediated communication model consisting of two parts: a content system and a reception system. The content is the message production system, while the reception system is

used by the audience to make sense of the various stimuli presented to them as the message. This is a model which, in essence, . represents the communication structure of a decoder. Dual coding theory, however, best matches the structure of the encoder in the communication process, where the message is developed from the understanding which is the desired intent of the communication. But the process as a whole is a combination of these two halves. And any examination of the process needs to consider both parts in a coherent whole in order to be worthwhile. Therefore, the mediated communication model and dual coding theory need each other to be complete.

All of the suggestions given here were developed based upon the experiences and research associated with mediated communication, especially that gained from the broadcast media. To apply this to the classroom, the model and the theory need a common element, and that element is the classroom teacher.

A teacher sits between the content itself and the receivers, between the work of dual coding theory and the mediated communication model. This position is not available within the model as it exists. At best, given the constraints of the model, the teacher's position would be as a producer and transmitter of content. But this model does not consider that the mediator comes after the real source of the information, which remains hidden to the audience. As in the classroom, that source is never identified as such. The receivers must accept the mediator as the source, although seen as a complete system this is a little inaccurate.

To make the model more effective within this context, the following suggestion is made: Extend the model to cover the entire process from source of information to the audience. While this may seem unnecessary in the limited context of the broadcast media, in the broader context of other mediated contexts, such as the classroom, it offers the opportunity to present a more complete picture. It offers the chance to show the mediator as a member of another audience, albeit an audience of one. In that audience, the teacher uses the imagens and logogens in evaluating the message from the source(s) of the content to understand, and then, as a mediator, to reinterpret the content for the new audience (students). Without this step, we face the prospect of considering the mediator as a transmitter of content only, while in fact we realize that the teacher does not merely relay information. One of the main responsibilities is the synthesis of information and the re-encoding into a new message (for which the teacher truly is the source). It is only in this light that we may begin to see dual coding theory operate. And it will operate effectively in the classroom, if only we will give it the opportunity.

References

Anderson, J.A. & Meyer, T.P. (1988). *Mediated communication: A social action perspective.* Beverly Hills, CA: SAGE Publications, Inc.

Mayer, R.E. & Anderson, R.B. (1991). "Animations Need Narrations: An Experimental Test of a Dual-Coding Hypothesis", *Journal of Educational Psychology,* 83(4), 484 - 490.

Mayer, R.E. & Anderson, R.B. (1992). "The Instructive Animation: Helping Students Build Connections Between Words and Pictures in Multimedia Learning," *Journal of Educational Psychology*, 84(4), 444 - 452.

Paivio, A. (1979). *Imagery and verbal processes*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Paivio, A. (1986). *Mental representations*. New York: Oxford University Press.

Sadoski, M., Goetz, T. & Fritz, J.B. (1993a). "Sentence Recall: Effects of Familiarity, Concreteness, Comprehensibility, and Interestingness," *Journal of Reading Behavior*, 25(1), 5 - 16.

Sadoski, M., Goetz, E.T., & Fritz, J.B. (1993b). "Impact of Concreteness on Comprehensibility, Interest, and Memory for Text: Implications for Dual Coding Theory and Text Design," *Journal of Educational Psychology*, 85(2), 291- 304.